



## FIRE ALARM SYSTEMS

{The following Guide Specification is intended to be modified and included in the construction contract documents. Items to be modified will be decided by consultation involving the Project Manager, the A/E, and Engineering Services. The A/E is expected to modify this and other specifications as necessary to accurately reflect commissioning requirements based upon specific conditions of the project. All italicized items are optional, or require special attention by the designer. Designer Notes such as this one are bracketed and must be deleted by submitting to Owner for review}

### **PART 1 - GENERAL INFORMATION AND REQUIREMENTS**

#### **1.01 ACRONYMS, TERMS, AND DEFINITIONS USED IN THESE SPECIFICATIONS**

SFD = City of Seattle Fire Department

OWNER = City

VENDOR = the local authorized representative of the manufacturer to sell, install, and service the fire alarm system.

LOCAL means the main office and service center are located within 50 miles of the job site.

SHOP DRAWINGS are the drawings created by the contractor (Installer and Vendor) utilizing AUTOCAD, submitted for approval and then used and modified by the Installer and Vendor during construction.

AS-BUILT drawings are a single set of shop drawings that shall be updated daily during construction. (See 1.10)

RECORD DRAWINGS shall include all of the information shown on the As-Built drawings. This information shall be added to AUTOCAD Architectural backgrounds. FACP designates Fire Alarm Control Panel, which processes alarm information and controls outputs.

#### **1.02 RELATED SECTIONS OF THE SPECIFICATION**

*{Note to designer: In this section, include the specification numbers of related specification sections.}*

#### **1.03 SCOPE OF WORK**

Work Included:

*This specification establishes the requirements for the design and installation of a complete fire detection and alerting system for {Building/Location} as described in this specification and the referenced drawings. The scope of work involves the installation of a fire alarm system to include but not limited to the following:*

Designing, providing and installing a complete fire detection and alerting system.

Provide permanent signs, labels, and operational instructions.

Designing, providing and installing all necessary conduit and wiring associated with the fire detection and alerting system.



Providing all necessary modules to make network connections between the fire alarm system and the Simplex 4100 system. These connections shall be fiber optic or standard telephone wire if no fiber is provided.

Providing smoke detectors, heat detectors, and manual alarm stations.

Providing speakers {horns}, strobes and remote lamps.

*Providing electromagnet door holders (coordinate with section XXXXX, Hardware Specialties).*

*Installing wiring and raceway to door closers and holders.*

*Providing remote annunciator panel(s).*

Providing one-way voice communication system as a part of the audio evacuation system.

*Providing auxiliary controls and switches including interposing control, monitor relays, and interconnection coordination for the operation of the following systems:*

*Door control {Section XXXXX}*

*Fan and damper control {Sections XXXXX, XXXXX}*

*Elevator recall {Section XXXXX}*

*Sprinkler systems {Section XXXXX}*

*Commissioning {Section 17XXX}*

*{Designer - Insert paragraph on the removal and salvage of existing FACP equipment, field devices, and wire if this is a part of this project. Abandoned raceway may remain if allowed by code.}*

*Provide testing and training as specified in {Section 4.02} {Section 17XXX}.*

*{Designer: Modify as appropriate, new buildings will likely include a commissioning specification, others may not.}*

Work Not Included:

Wiring and conduit between the fire alarm system and the Simplex 4100 Fire Alarm Control Panel for network connection.

#### 1.04 CODES AND STANDARDS

Perform all work in accordance with the requirements of the latest issue of the following codes and standards, unless specifically directed otherwise in this specification in order to allow designs in excess of the code requirements.

Uniform Fire Code with Local Amendments (Including SFD Administrative Rulings)

Uniform Building Code with Local Amendments Including DCLU Director's Rules)

NFPA 71 - Central Station Signaling Systems



NFPA 72 - National Fire Alarm Code (NFPA 72)

WAC - (Washington Administrative Code) 296-46

NEC - National Electric Code (NFPA 70)

Safety Code for Elevators and Escalators (ANSI A17.1) as Amended by DCLU Director's Rule 3-91

Americans with Disabilities Act (ADA)

Local rules and interpretations required by the Authority having jurisdiction, including Seattle Building and Fire Codes.

#### 1.05 APPROVAL AUTHORITIES

The approval authority for this section of the project shall be the City Project Manager and the Seattle Fire Department.

#### 1.06 FIRE ALARM VENDOR QUALIFICATIONS GENERAL

The entire Fire Alarm System shall be installed by skilled electricians and mechanics, all of which are properly trained and qualified for this work. As a minimum, conform to all codes and manufacturers recommendations.

The vender shall design, supervise, program and commission the installed system and shall provide warranty service.

The vender shall be the local authorized representative of the manufacturer.

The vender shall have the ability to provide any replacement part on site within 48 hours.

The vendor shall be able to provide a fully equipped and qualified, factory trained repair technician at the job site within four (4) hours of a request for emergency service. This service shall be available 24 hrs./day during the term of the warranty.

#### 1.07 SITE CONDITIONS

The contractor is advised that the drawings are diagrammatic in nature and do not intend to show all details. Contractor is expected to provide all miscellaneous parts and labor required to install a complete workable system.

The Contractor shall coordinate with the City Project Manager to define areas where the Installer can store tools, equipment and other materials for this project. The area is to be kept clean and neat at all times. The Contractor will be responsible for the security of all items stored in this area. Construction debris shall be removed daily.

#### 1.08 FIRE WATCH AND FIRE PROTECTION SYSTEM SHUTDOWNS

Where it is necessary to shut down existing Fire Alarm Systems outside of normal working hours (7:00 AM to 5:00 PM), the Contractor shall provide a continuous approved fire watch during such a shutdown. Fire watch shall be performed by licensed security personnel, trained in the use and operation of portable fire extinguishers and instructed in how to contact the City Emergency Services Unit by either radio or telephone.



Continuous rounds to cover all areas of the building are required every 30 minutes. A log of the rounds and copious notes shall be maintained.

*{Designer: If a fire watch period longer than a single shift is anticipated, please confer with the City Project Manager and provide details here. A plan must be prepared by the contractor to ensure the fire watch period is as short as practical.}*

Provide 14 days written notification to the City Project Manager requesting approval for fire protection system shutdown or functional impairment. The receipt of the approval from the City Project Manager is required before any system shutdown or functional impairment.

#### 1.09 SUBMITTALS

Conform to: Section 1300, Shop Drawings and Product Data and Samples.

Within 20 working days after award of contract prepare and submit (6) copies of shop drawings and catalog cut sheets and additional information required in this section, via the A/E, to the City Project Manager for Owner approval. Upon receipt of this approval, shop drawings shall then be forwarded to the SFD for their approval. One copy of owner approved shop drawings with SFD approval, and accompanying letter shall then be submitted to the City Project Manager. Partial submittals are unacceptable. The Vendor shall not start any construction nor order any materials prior to acceptance of all submittals by the Owner and the SFD. Submittals, as a minimum, shall include the following:

Floor plans drawn with AUTOCAD to same scale as the Architectural drawings showing device layout, raceway routing, riser diagrams, conduit and wire size, wire identification numbers, room and floor identification numbers. These drawings shall be produced as follows:

The Architect shall forward a copy of the Architectural backgrounds to the Contractor.

The Contractor shall create drawings showing all equipment locations and all wiring requirements and City symbols as illustrated on the plans.

With this information and drawings, the Contractor shall create a raceway, conduit and riser design meeting the requirements in section 3.05.

The Contractor shall then insure completeness including wire information, room numbers, devices, equipment and all other pertinent information.

Typical point-to-point wiring diagrams of the control panels, including but not limited to, all control and annunciator panel components, field devices, relays, fans, elevators, and other auxiliary control(s), and terminal cabinets showing all installed wiring (not factory wiring harnesses) and wiring connections. All variances from typical shall be illustrated in separate diagrams. All components shall be labeled.

Detailed mounting installation diagrams of the control panel(s), remote annunciator(s) and keyed signal silencing switch.

Provide battery calculations, speaker, and strobe circuit power drop and power consumption.

Riser diagrams with circuit identification labels, conduit and wire size, and device locations (with room numbers).

Functional response matrix identifying all system responses.



Front view of the control panel(s) and all annunciator panels.

FACP, labels and labeling schemes for circuits, and field devices. Nameplates and messages on the control panel(s) and annunciators shall be provided in actual size.

Wire/circuit legend with circuit identification, color, gauge, wire type, number of conductors, etc.

Raceway size calculations showing % fill in accordance with this specification.

Circuit schedules for speakers, strobes, auxiliary controls, and software/advisory code zones.

Schedule of addressable circuits and corresponding circuit lengths.

A Materials Submittal cover sheet identifying all FACP equipment, model number, and quantities.

Within 20 working days after owner approval of shop drawings and catalog cut sheets, submit the following for review and approval via the construction coordinator to the City Project Manager for Owner approval:

A written acceptance test procedure. See Section 4.02.

A complete fire alarm point list for all addressable devices and circuits to identify the device address (initiating only), manufacturer fixed labels (device type), custom labels and software zone. This list shall also include signaling and all other auxiliary circuits. Prepare this list on Microsoft Excel using 8 1/2 x 11 inch or larger sheets.

#### 1.10 AS-BUILT DRAWINGS

While the system installation is in progress, one set of shop drawings will be kept at the job site. This set will be designated as the As-Built drawings and will be updated regularly to reflect current as-built information. One set of As-Built drawings can be replaced with a fresh updated set of drawings but there shall never be more than one active set of As-Built drawings. The City shall be given access to this set of As-Built drawings at all times so that progress may be reviewed and copies may be made. At the end of the project, these marked up As-Built drawings shall be submitted as part of the As-built drawings, (see section 4.01).

#### 1.11 FIRE ALARM SYSTEM DESCRIPTION

Equipment and Materials shall Include:

Fire Alarm Control Panel(s)

Equipment and Circuits for:

Alarm initiating devices.

Evacuation signaling devices.

Fire alarm system monitored, controlled, and powered equipment.

Communication Systems

#### 1.12 SYSTEM OPERATION DESCRIPTION



**Fire Alarm Functions:**

Activation of a pull station, sprinkler water flow or activation of an automatic sensing device for fire, temperature, flame, or smoke shall:

Cause an audible evacuation alarm signal to continuously sound a SLOW WHOOP signal until the system is reset or the voice override is utilized.

Cause the visual evacuation alarm devices to flash rapidly until the system is reset.

Cause an alarm condition to be transmitted, through a peer-to-peer network connection, to the Simplex 4100 Fire Alarm Control Panel.

**Auxiliary Control Functions:**

The fire alarm system shall, during certain alarm conditions, control the following types of equipment {Designer to specify. (Examples: doors, fans, dampers, elevators, etc.)}. It is the responsibility of this specification to provide raceway wire from the FACP to all equipment specified to respond to an alarm. Direct control from detector output contacts is not permissible. As a minimum, the controls shall:

Automatically restore the controlled systems to normal operation after FACP is reset from alarm posture.

*If there are two or more fans of 20 HP or greater controlled directly from the FACP, then the fans shall "stagger start" with an appropriate delay between each start. The time delay shall be incorporated into the fire alarm system programming. A 10-second delay between fan restart is recommended.*

*Cause elevator Phase I operation.*

**Fan control:**

**Environmental Fans:** The following general buildings fans shall shut down upon activation of any fire alarm device via direct control from the FACP. FACP control shall have priority over all other interlocks and controls.

*Fans: {Designer: Provide a schedule of fans to include all environmental fans that supply and return air and are 10,000 CFM (2000 CFM for multi-floor systems). An exception to automatic shut down on general alarm may be necessary where fan shutdown would adversely affect the space. (i.e., animal areas). In such case only an alarm initiated from within the zone would shut down the fans in the zone.}*

*{The designer must determine if the building fans other than those identified above need to be controlled to ensure equipment safety or to address adverse environmental pressure differential created by the required fan response. Fans that solely exhaust air from a building may in some cases shut down with the supply and/or return fan, and in other cases remain running. An alarm contact is often necessary at the FACP for the building ventilation control system so it may respond appropriately during an alarm. Coordinate design with division 15000.}*

*For dedicated fire safety fans, provide a simple and reliable control arrangement. Motorized dampers, control logic, and division 15000 wiring is discouraged. Where controlled dampers are necessary on dedicated fans, the associated control logic, switches, relays, and wiring may be specified in division 15000, but be independent of the environmental control system*

**Dedicated Fire Safety Fans:** The following shaft pressurization and other dedicated fire safety fans shall start and be controlled directly from the FACP:



*Fans: {Designer: Provide a list of fans.}*

Manual override: Provide on-off-auto manual override switches with priority over local HOA, and other automatic control for all dedicated fire safety fans as identified above.

Fan Status: Provide positive feedback fan status at the FACP using a voltage sensor relay located at the load side of the disconnect switch for all dedicated fire safety fans. Provide a red LED for stop and a green LED for run.

*{Designer: Provide specific wiring diagrams for (a) through (d) above. Confirm voltage sensor relay is specified in appropriate division for this project.}*

### 1.13 SUPERVISORY FUNCTIONS

Supervise the 120 VAC circuits supplying the FACP.

Supervise the alarm initiating circuits, building signaling circuits, and auxiliary control circuits, except the door circuits, against grounds, opens, and shorts.

Any equipment trouble or malfunction shall sound a local buzzer, turn on an externally visible amber light (LED) in the FACP and cause a trouble condition to be transmitted, through a peer-to-peer network connection, to the Simplex 4100 Fire Alarm Control Panel.

Any activation of a sprinkler system supervisory switch, shall sound a local buzzer, turn on an externally visible amber light (LED) in the FACP and cause a supervisory condition to be transmitted, through a peer-to-peer network connection, to the Simplex 4100 Fire Alarm Control Panel.

Upon application or reapplication of 120 VAC power, the fire alarm system shall automatically, without any operator intervention, initialize all circuitry and shall be in a normal operating condition. Systems which require operator intervention to reset manual controls following a 120 VAC restoration are not acceptable.

#### Annunciation and Manual Switches

Each initiating device shall annunciate at the FACP {and remote annunciator} as a discrete point on an alphanumeric display. In addition, the appropriate software zone LED shall light at the FACP.

Provide descriptive alphanumeric program labels for each system initiating device in accordance with the following format:

Floor-Zone-Device Type (if not included in standard manufacturer LCD labels)-Specific Information and/or Location (and special access notes.)

Examples:

4th Fl, C-Wing, Smoke, Corridor by room 432.

7th Fl, Duct Det, SF-2, in Mech room 711.

3rd Fl, Tower, Waterflow, in Stair no.2.

Provide manual switches and status LEDs at the FACP for fans as described herein and on the plans.

*{Designer, add manual switching for fans, etc at the remote annunciator if require. Confer with City and SFD}*



**Fire Control Communication Systems:**

The fire alarm speaker system shall incorporate a "one way" fire commander's voice communication or paging system. A microphone shall be placed at the main control panel. {and at the remote annunciator}.

*{Designer: Confer with SFD to determine requirement for remote annunciator microphone}.*

**1.14 INTERFACE WITH EXISTING FIRE ALARM SYSTEM**

*If interface is part of this project, coordinate with other sections of 16721 and with City for specific requirements. The existing fire alarm system shall not be disabled at any time.*

**PART 2 - PRODUCTS**

**2.01 MATERIALS**

All materials and equipment shall be new. Previously used equipment shall not be acceptable unless specifically identified elsewhere in this specification.

**2.02 MANUFACTURER**

The fire alarm control equipment shall consist of a system assembled as an approved unit of regularly manufactured components, by a single manufacturer for the purposes described elsewhere in this specification. The fire alarm control equipment shall be of equipment that has a proven track record of service and reliability in projects of similar scope to this project. Interconnecting equipment that has not been listed for interconnection, or the creation of components or system into a nonstandard unit that is not normally available from the manufacturer is not acceptable.

All equipment shall be listed, cross-listed and labeled by Underwriters' Laboratories and approved by Factory Mutual.

Providing they meet all specifications, control panels and related equipment shall be manufactured by Simplex, no exception or substitution.

**2.03 LOCKS**

Locks for cabinets, enclosures, and manual pull stations shall be keyed alike. Simplex "B".

**2.04 FIRE ALARM CONTROL PANELS (FACP)**

FACP shall be microprocessor operated, modular in design and equipped with a nonvolatile memory that requires no battery backup. Simplex, no exceptions, no substitution.

*{Designer, confer with City. For small buildings much of the language of this specification must be culled. This specification is written around the features common to the 4100 system. Most UW buildings will receive the 4100 system}.*

A single FACP shall be able to utilize, in combination, addressable, analog, and 2/4 wire NO/NC detectors. (Plug-in "mix and match" modules or similar architecture is acceptable.)

City personnel shall be able to create and modify control software with an IBM compatible PC utilizing MS-DOS based, menu driven, user friendly programming. City personnel shall be able to store the programming on a removable computer disk and pre-program a nonvolatile, transportable memory storage



device which can be used for replacement in a FACP as the programming backup. All software including proprietary software shall be provided to the UW as necessary to meet the above requirements.

Fire Alarm System shall be wired for "Class B" operation on alarm initiating and signaling (notification) circuits. All end of line devices shall be located in the terminal cabinet or the end of the corridor for the zone served. Tee tapping is not allowed on conventional systems.

FACP shall incorporate power supplies and all controls for systems except as described elsewhere within the specification. Field control modules are not allowed. Alarm output and auxiliary controls shall not be integrated with detection circuits. All amplifiers shall be located at the head-end (FACP) of the system. All components shall be mounted within a steel enclosure with locked door(s). Door(s) shall incorporate a transparent window for viewing indicator lights, and other pertinent components. Cabinet(s) shall be mounted as indicated on the drawings. Provisions shall be made in or near the FACP for storing connection and schematic wiring diagrams, and emergency operating plans.

*{Designer. Transponders for auxiliary control will be approved for exceptionally large projects.}*

#### Initiating Circuits:

The FACP shall support independent addressable circuits, originating from FACP mounted hardware, for each floor and zone. No circuit shall exceed 2000 feet in length.

#### Signaling Circuits:

The FACP shall support independent speaker circuits originating from FACP mounted hardware, for each floor and zone of the building.

Provide a schedule by performing circuit load calculations considering wire length, gauge, number of devices, and FACP specifications. A single circuit shall not be used for multiple floors or zones; however, a number of circuits may be required for a single zone.

The FACP shall support independent strobe circuits, originating from FACP mounted hardware, for each floor and zone of the building.

Provide a schedule by performing circuit load calculations considering wire length, 14-gauge THHN wire, number of devices, and FACP specifications. A single circuit shall not be used for multiple floors or zones; however, a number of circuits may be required for a single zone.

*{Designer: A prescriptive schedule for signaling circuit is preferred in lieu of the performance base criteria noted above. If a schedule is to be produced by the A/E, the raceway system must be fully detailed on the plans and calculations submitted to support the circuit schedule.}*

The FACP shall support independent door and {corridor damper} control circuits originating from FACP mounted hardware for each floor and zone of the building.

*{Designer: Modify/expand above for systems employing remote transponders.}*

Provide FACP spare equipment for 5% (at least two each) spare fully operational speaker, strobe and auxiliary control circuits.

#### Power Supplies:



The FACP 24 VDC power supply shall be powered by 120-volt AC power. A battery backup system regardless of the building's primary or alternate source of power. The system shall also have the following requirements:

Sealed gelled cell type batteries.

24-hour system backup capability plus 5 minutes of full alarm operation at the end of the 24-hour period.

*{Designer. Systems serving as a preaction releasing system will require additional backup capability.}*

Charger shall be able to restore batteries to full charge within 48 hours after a complete discharge.

Battery and charging system shall be supervised by the FACP, including trouble annunciation of high/low voltage, shorted cell and open circuits.

Emergency power is not required for the door holders. Doors may close upon loss of building power.

Other FACP Features:

**Walk Test:** A test mode that causes the systems signal to sound, and a report printed, when a device is activated, or a trouble or supervisory condition identified, followed by a prompt automatic reset of the FACP. The signal sounding shall be capable of being turned off independent of the printing function. This feature shall be available for system acceptance testing/commissioning.

**Alarm Verification:** An activated smoke detector shall automatically reset and then recheck the atmosphere following a 60 second waiting period. The fire alarm system shall not be activated until detection is confirmed following the waiting period. Activation of a second detector during the waiting period shall activate the alarm system immediately. All area and duct smoke detectors shall be enabled with this feature. Provide a disabling feature at the system keypad for system commissioning and Owner confidence testing. Disabling this feature shall be accomplished via the keypad on a zone, or group of zones, basis. Enable the feature following Owner and SFD approval of the system.

**History Log:** Shall log a history of alarm and trouble events for the system in the normal and Walk test mode.

Other FACP Components Shall Include:

Alarm and trouble lights located to be visible with the door closed.

System reset switch.

Trouble buzzer with silencing switch inside locked cabinet.

Control relays as required.

Supervised switches (one for each listed function) installed to allow a complete test of the system without evacuating the building, recalling elevators, releasing doors and/or posturing for smoke control (i.e. bypass switches).

Supervised control switches or relays for use in interfacing with other devices as required.

Permanent printed labels for all interactive equipment, zones, switches, controls, and instruction.



#### 2.05 VOICE COMMUNICATION SYSTEM

Audio amplifiers shall be sized to provide one-half (1/2) Watt minimum per attached audio speaker as shown on the drawings. Each audio amplifier shall have 50% minimum spare capacity when attached to the speakers necessary to meet audio requirements.

FACP shall incorporate a spare automatic backup audio amplifier equal in size to the largest individual amplifier.

#### 2.06 MANUAL STATIONS

Manual pull stations shall be addressable double action with breakable element. Reset shall be accomplished with a lock and key. The station housing shall be fire red factory finish. Exposed back boxes shall be provided by the manual station manufacturer and be designed specifically for the application.

#### 2.07 SMOKE DETECTORS/SENSORS

*{Note to Designer: Duct detectors must be furnished by this specification to ensure compatibility. Confirm division 15XXX does call for duct detectors.}*

Ceiling or area type smoke detectors shall be photoelectric addressable analog with separate base. The detectors, complete with terminating equipment shall be fully supervised and shall not activate alarm due to rapid changes in humidity, or a fan maintenance shutdown, etc. The detector shall be equipped with LED alarm condition indicator light. When exposed back boxes are needed, use round "wire mold" boxes of the appropriate size.

Duct type smoke detectors shall be addressable analog photoelectric, in an enclosure with remote indicator and reset. The devices shall include necessary sampling tube extensions. The device shall function uniformly in air velocities of 500 FPM through 3000 FPM. Heat sensor feature is not required. Remote indicating light shall be installed where shown on the drawings, and where detector indicating lights are not readily visible. Remote indicator lights shall be mounted in the hallways or lobby, preferable above the door to the area protected. Device shall be flush or semi-flush mounted with identifying nameplate.

#### 2.08 HEAT DETECTORS

Heat detectors shall be combination of fixed temperature and rate-of-rise low profile addressable type and shall be "ordinary" temperature range in all areas except where located in a high ambient temperature area, where they shall be "intermediate" temperature as defined in NFPA 72. Conventional heat detectors with an addressable monitor module may be used where intermediate temperature detectors are required. An indicator on the exposed surface of the detector shall display the actuated condition of the detector. Analog detectors may be used as part of an addressable system.

#### 2.09 ADDRESSABLE INTERFACE MODULE

Provide addressable interface modules to interface with non-addressable initiating devices, i.e. water flow, tamper switches. Field control modules are not allowed.

#### 2.10 MODULE ALARM DEVICES

*{Designer : Please confirm appropriate equipment is specified in areas with a severe environment. Environments beyond those outlined below may require special consideration.}*



Speakers shall be 75/15 Candela (with strobe) re-entrant type with die-cast housing. They shall have multiple wattage taps including 1/8, 1/4, 1/2, 1 watt, and 2 watts. They shall not be used at wattage greater than two (2). All speakers shall be installed at the 1/2-watt setting unless indicated otherwise on the drawings. The grill shall be designed to prevent damage by pointed objects. Speakers shall be suitable for flush mounting in accessible ceilings. For surface mounting use a finished enclosure, painted red, provided by the manufacturer, for use with the speaker. Cone type speakers are not permitted.

*{Designer: Identify speaker tap settings exceptions on the drawings. Speakers located in restrooms and other remote locations where the intent is to alarm only the room where placed should be tapped at 1/8 to 1/4 watt.}*

Outdoor and Environmental Rooms with high humidity and controlled temperature, including coolers and freezers. Provide weatherproof back box with weep hole oriented down, and seal conduit penetration with mastic and orient weep holes down.

*{Designer: For horn systems replace the paragraph above with the following:}*

Horn/Strobes: Multitone with 15/75 Candela strobe with slow whoop tone option. set horns for a slow whoop tone.

An open circuit in any speaker or horn coil shall not prevent the rest of the audio devices connected to that circuit from operating. If a short circuit occurs, the faulted circuit shall not prevent any other circuit from operating and trouble shall be indicated. If the shorted circuit clears, signaling operation shall be automatically restored.

The speaker cable shield or drain wire shall remain intact and be spliced through all terminal cabinets, junction boxes and speakers. The drain wire shall not be grounded for terminated except at the main FACP. Wherever the drain wire is exposed, it shall be wrapped with UL approved electrical tape, in order to avoid shorts or grounds.

#### 2.11 STROBES (Visual Alarm)

Visual alarm signal shall operate at 24 volts DC and be equipped with a Xenon strobe flashing light which meet the ADA requirement (75/15 candela minimum). The thermoplastic lens shall be white with red letters. Strobes shall be combined into one unit with speakers (or horns) where appropriate.

#### 2.12 DOOR HOLDERS

*{Designer; coordinate with section 8700, Hardware Specialties. Clearly indicate who will furnish and who will install.}*

Provide, furnish, and install Rixon Style (Simplex series 2088) wall mount and floor mount or approved equal. Where it is physically impractical to use the Simplex series 2088 style door holders, LCN series 4040 door closers may be used with owner approval. {Refer to Section 8700 Hardware Specialties, for door closers.} Power for door holders shall be 24 VDC and originate from the FACP but shall not transfer to battery power upon loss of 120 VAC.

*{Designer. On retrofit projects where no 8700 section exists, identify the LCN type door closers on the plans.}*

#### 2.13 ELEVATOR CONTROL



Provide relays and wiring from FACP to the elevator machine room as identified on the plans for activation of the elevator phase I recall system. Interposing relays shall be UL cross listed with the FACP.

#### 2.14 SPRINKLER SYSTEM ALARM AND SUPERVISORY SWITCHES

Shall be provided by Division 15000. Wiring and raceway and final connection to the fire alarm system shall be required by this section, 16721.

#### 2.15 PRINTER PORT

Provide and install a printer port for use by City personnel for testing and maintenance. Printer(s) shall receive English language text from the fire alarm control panel in an industry standard ASCII format via an EIA RS-232-C connection.

All printed information shall include time and date.

#### 2.16 FIRE ALARM TERMINAL CABINETS AND AUXILIARY CABINETS

Enclosures shall be NEMA Type 1 or Type 12 and sized for 20% spare capacity. All panels shall be {surface, or flush} mounted with hinged door and latch with lock. Box and front shall be steel, painted to match wall in finished areas.

Fire alarm terminal cabinet shall be labeled with a riveted or screwed laminated plastic nameplate indicating "FIRE ALARM TERMINAL CABINET" in 1/4" white letters on a red background.

Provide a wire scheme similar that specified herein inside of the cabinet door. Also, provide a schedule identifying all end of line resistors for the zone and their respective locations.

Provide terminal blocks in all terminal cabinets and auxiliary control cabinets. These blocks shall be sized to accommodate wire from 19 gauge to 10 gauge.

Back boards in the terminal cabinets shall be constructed of fire retardant treated 3/4" exterior grade plywood, painted white.

#### 2.17 REMOTE ANNUNCIATOR

Provide an alphanumeric type remote annunciator with 80 character LCD display, and system acknowledge switch(s). Do not provide zone LEDs.

*{Designer: Specify manual override switches for fans, microphone and other options as required for the project. Specify surface, flush or semi-recessed mounting}.*

#### 2.18 SPARES

In addition to spare capacities and equipment listed in other portions of this specification, the following spare components shall be provided and installed in the FACP cabinet.

*Auxiliary relays, minimum 5 amp. form "C" contacts - {insert value}.*

*Control/Bypass switches - {insert value}.*

#### 2.19 SMOKE/FIRE DAMPERS



Shall be provided by division 15000.

Interface relays shall be provided to operate 120VAC AC smoke dampers from the 24VDC fire alarm system. Fire alarm relay contacts shall be rated at 10 amps. Interface relay to be provided in Nema 1 enclosure in the proximity of the each terminal cabinet. The interposing relay is to be normally closed and the damper(s) powered open. Upon alarm, or AC power failure, the damper(s) shall close.

Relay must be UL cross listed with the FACP

*{Designer: It is the intent to control multiple corridor fire/smoke dampers with a single interposing relay. Show a NEMA 1 enclosure on plan sheets for each zone as appropriate.}*

### **PART 3 - INSTALLATION**

#### **3.01 APPROVAL**

No equipment shall be provided at the job site until shop drawings have been reviewed and approved by the City and SFD. A City and SFD approved shop drawing set shall be continuously available at the job site during construction.

#### **3.02 MOUNTING POSITION**

FACP - Locate as shown on the drawings.

SPEAKER {HORN}/STROBE - Shall be mounted on the walls, 80 inches above finish floor to bottom of device.

*{Designer; Ceiling mounted speakers are also acceptable and occasionally necessary in open areas where audibility cannot be reached otherwise. In such case, separate wall mount strobes must be shown.}*

PULL STATIONS - Four feet from floor to center of device.

BATTERY CABINET - If shown, locate as illustrated on the drawings. If required due to physical constraints and not shown, consult the Owner.

DUCT DETECTORS - Placement must conform to NFPA standards. Coordinate location with mechanical. For assistance consult with UW Fire Protection Engineer or A/E.

REMOTE ANNUNCIATOR PANEL - Location shall be as shown on the drawings.

#### **3.03 MOUNTING METHODS**

Conduit, panels, devices and boxes shall be secured by means of expansion shields in concrete, machine screws on metal surfaces and wood screws on wood construction. Attachment with devices driven in by power charge or nail type nylon anchors are not acceptable in lieu of machine screws.

#### **3.04 AUXILIARY CONTROLS**

*{Designer; Show terminal boxes/junction boxes on plans at HVAC controller, elevator controller, fans, dampers, etc. as necessary to clearly indicate inclusions in this specification}*

Provide all wire ways, wiring, interposing relays, terminal boxes, and relay cabinets for FACP controlled equipment including fans, dampers, doors, elevators, etc. Each type of equipment shall be controlled by



dedicated double throw relay(s) located in or adjacent to the FACP or elsewhere in the building as indicated in the specifications and/or on the drawings.

### 3.05 WIRING

General Wiring and Raceway System:

The manufacturer's recommendations shall only be used as a minimum requirement.

All wire shall be new, UL approved and marked, and brought to the job site in original packages.

Wire insulation shall be one of the types required by NEC. All wires shall be sized per the NEC for the load serviced. Field wiring for initiation, supervision and signal circuits shall be solid conductor. All wire shall be approved for fire alarm installations.

Fire alarm system shall be wired "Class B", device to device, with no splicing unless approve by the Owner. End of line resistors shall be located in the terminal cabinet or the end of the corridor or other unassigned (public) space for the zone served.

Colors shall match when possible and the conductors shall be mechanically secured to each other such that no stress shall be applied to the splice.

Aluminum wire is prohibited. Stranded wire is prohibited.

Wire pulls by powered mechanical means will not be permitted. Conduit shall be thoroughly cleaned of all foreign material just prior to pulling the wire or cable. Lubricants shall be compounds specifically prepared for cable pulling and shall not contain petroleum or other products, which will affect cable insulation.

Wire that has scrapes, nicks, gouges, or crushed insulation shall not be used and shall be removed.

Low voltage energy limited wiring shall not be run in the same wire ways with or closely parallel to high voltage and/or switched power wiring.

Interposing relays shall be used for all switched power loads and shall be located such that the switched power conductors do not run in the same raceway as the interposing relay coil power or any other energy limited low voltage conductors.

All wiring shall be contained in metal conduit or raceways dedicated to fire alarm service.

Conduit size shall be 3/4" minimum unless approved in writing. Wire mold shall be #700 minimum.

No raceway shall be filled such that the maximum filled in excess of 60%. The contractor shall demonstrate by performing fill calculations that the designs complies with this criteria. Exceptions are only allowed when use of existing wire ways is approved.

Provide 6x6 inch or larger junction boxes at all junctions where more than three conduits are combined, and for all junctions on the main lateral conduit run for the floor/zone. Use of extension rings to achieve adequate space for a device or junction is not allowed.

The raceway system shall resemble a branch and tree configuration where the main run has limited offsets, and branch line run perpendicular to the main run. Each device shall be connected from a junction box on the main FA raceway so that main raceway does not pass through a device back box. Branches shall be



provided with sufficient junction boxes so that not more than three unassociated circuits pass through a device back box.

Main Lateral runs in a zone shall be sized at one (1) inch minimum.

*{Designer: It is preferred to route the main raceway in the corridor and branch off perpendicular to pick up the devices.}*

All raceways shall run parallel or perpendicular to walls, floors, and ceilings.

Raceway(s) between FACP and terminal cabinets shall not be larger than 2 1/2 inch diameter. Where additional capacity is needed, provide a second, third, or more raceways.

As a minimum, provide a single 1 1/2 inch diameter raceway between the FACP and terminal cabinets, regardless of the wire fill.

Do not encase raceway in concrete unless specifically called for.

No wire run or circuit shall be longer than 80% of the maximum allowable length and power consumption for the wire size and application. No output circuit shall exceed 80% of the maximum load capacity specified by the manufacturer.

All wiring for each zone or floor shall be terminated in a terminal cabinet as indicated on the contract drawings prior to running the wires to the fire alarm panel. Provide at least one terminal cabinet for each floor.

All solid wire terminations shall be made bare to screw terminals specifically designed for bare wire connection. Cable shield terminations shall be made with T&B "Sta-Kon" (or equivalent) self-insulated, spade lugs where connected to screw type terminals.

Wiring in all cabinets and terminal boxes shall be neatly arranged and bundled with tie wraps or equivalent.

All junction boxes and covers for the fire alarm system shall be painted red inside and outside except that J-Box covers in finished areas shall be painted to match the wall or ceiling and have a 1/2 inch minimum red dot on the cover.

All conduit and raceways shall be color coded by a 3/4 inch red tape band at 10 ft. intervals. Tape shall be Scotch Brand #35 or approved equal.

All circuits and conduits shall be identified with labels to include circuit type, zone, floor, wing, and conduit number. Labels must be provided at the FACP, annunciator, terminal cabinets, and auxiliary cabinets. Labels shall be produced using an electronic labeler.

All initiating and signaling circuit devices shall be externally labeled with a printed adhesive label approximately 1/2 by 1 inch in size. Identify the circuit and zone, consistent with wire labeling scheme, using a 12 to 14 point font, black ink on white.

#### **PART 4 - FINAL ACCEPTANCE REQUIREMENTS**

##### **4.01 RECORD DOCUMENTS**

As a condition for the project final acceptance, the vendor shall, submit the following documents to the City Project Manager for approval:



*Operation and Maintenance Manuals: See Section 01700. Submit a copy of the O&M Manual to the City Project Manager. The O&M Manual shall include as-built drawings as listed below catalog cuts, and manufacturer wiring diagrams of all FACP components. Photo Copies are not acceptable.*

#### As-Built Drawings:

The as-built drawings shall be neatly prepared on AUTOCAD Release 12 (or higher). The City will provide use of a standard template, a library of symbols, colors and layers and one day of support and instruction in the City protocols. Provide two (2) sets of prints, one set of fixed line Mylar reproducible (size 24" x 36" or 36" x 42") and two sets of AUTOCAD disks. These drawings shall include:

All requirements listed for shop drawings per 1.09.

Changes as a result of final installation, testing, or a change to the system design. These drawings shall include an accurate depiction of risers, raceway, conduit, all wire runs, cable identification, conduit size, location of junction boxes, terminal boxes, sources of power, devices, sensors, equipment, controlled equipment (motor starters, fans, pumps, valves, dampers, etc.).

#### 4.02 TESTING

The completed system shall be subjected to two required tests. The initial test shall be a preliminary test that will be conducted by the contractor and witnessed by the City Project Manager and the A/E. This test shall be completed after the system has been on line for a minimum of seven days. Should the results not be satisfactory to the City representatives, then corrections will be made and a re-test will be required at the contractor's expense. The Installer and a factory trained technician for the FACP shall be present for all testing.

The preliminary test shall be in accordance with a written Functional Test Procedure (FTP) to demonstrate and certify proper system operation. The FTP shall be prepared by the contractor and submitted to the Owner for approval prior to the performance of the FTP. As a minimum, the FTP shall provide a detailed method of testing and documenting the following to demonstrate to the Owner that the systems function as intended by the design. The document shall include written test procedure and customized check off sheets for the following as a minimum:

All detectors shall be removed from their mounting boxes. A wire shall be lifted from each detector, one at a time to verify proper supervision of the devices.

All audible alarm devices shall be removed from their mounting boxes. A wire shall be lifted from each device, one at a time to verify proper supervision of the devices.

All bypass and control switches shall be operated to indicate proper supervision of the switch.

All valve and sprinkler supervision switches shall be operated to verify proper response.

All valve and sprinkler supervision switches shall have one wire removed to verify proper supervision.

Each alarm output, detection or supervision zone may be tested for proper response to ground conditions.

*AC power shall be interrupted for 24 hours by a 5 minute alarm test.*

All critical fuses shall be removed to check for proper supervision.

All detectors shall be tested for alarm operation.



All strobe units will be tested for wiring supervision by removing a wire from the device. The device will also be tested for proper alarm operation.

All alarm sounding devices will be tested for proper operation.

*Audibility tests will be conducted by the Contractor to determine compliance with the dBA requirements. For replacement systems in occupied buildings, the audibility test shall be conducted after normal working*

*{Designer: Please inquire with City Project Manager and modify this clause for the project.}*

All elevator, fan, door holder, damper etc. control functions and circuits shall be tested for proper supervision and operation.

*Test for proper operation of the All Call portion of the FACP.*

Fan and damper control, including manual override and priorities. Coordinate with other trades.

Magnetic door closers, holders, locking mechanisms. Verify appropriate priority with security and access control systems.

Elevator recall, Phase I and II.

Transfer to emergency power, where provided.

*{Designer: Add any other requirements as may be needed for the specific project including any additional tests required by the City. To be filled in or eliminated by the designer.}*

Test alarm verification function. Confirm no delay occurs if two detectors are activated.

Confirm analog sensor adjustable sensitivity function is operable and properly set.

Interface with the Simplex 4100 Fire Alarm Control Panel.

After satisfactory completion of the preliminary testing, the Contractor shall arrange for the SFD to witness a final contractor executed acceptance test of the system. Final acceptance will be granted jointly by the SFD and the City Project Manager or the City's designated representative. Approval of the AHJ shall be evidenced in writing and a copy forwarded to the City.

The requirements for final testing shall be as requested by SFD at the final test.

#### 4.03 TRAINING

*{Designer to discuss particular needs with City for each project. This may include factory schools, etc.}*

The vendor shall, after two weeks (minimum) written notification to the architect and the City, conduct a training session during which all maintenance and operational aspects of the system will be described and demonstrated to personnel selected by the owner. The session(s) shall be conducted by a manufacturer's representative thoroughly familiar with the characteristics of the installed system.

#### 4.04 OTHER ITEMS:



At the completion of the installation when the as-built drawings have been submitted and accepted, the contractor shall submit a letter to the *City* certifying that the fire alarm system is completely functional and conforms to all applicable codes, ordinances, and requirements of the contract.

Submit installation permit from the AHJ to the *City* Project Manager.

#### 4.05 PROJECT COMPLETION

Project completion and payment will be based on completion of the following:

Completion and approval of acceptance tests.

Completion of punch list items.

Delivery and acceptance of the as-built drawings and operation and maintenance manuals.

Cleanup of installation site to the satisfaction of the City's representative.

**End of Appendix 4 - A**